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Cheeseman

MYCETOZOA OF AUSTRALIA AND NEW ZEALAND.

Part I., by W. N. CHEESEMAN, F.L.S.

Part II., by G. LISTER, F.L.S.

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MYCETOZOA OF AUSTRALIA AND NEW ZEALAND.

PART I., W. N. CHEESMAN, F.L.S., PART II., G. LISTER, F.L.S.

I.

THE Mycetozoa recorded in this list were collected chiefly during the meeting of the British Association in Australia, and afterwards in a short visit to the North Island, New Zealand, in the months of August and September, 1914.

The climate of Temperate Australia is usually wet in the winter months, from June to August, and dry for the rest of the year, but owing to the uncertainty and inequality of the rainfall, long droughts followed by floods are apt to disturb the regularity of the seasons. We arrived after a long spell of dry weather, and during the visits we paid to the States of West Australia, South Australia, Victoria, New South Wales, and Queensland dry conditions prevailed. In spite of this, in the scanty time available for collecting, fifty-one species of Mycetozoa were found. Few plasmodia were seen, and these only in damp fern gullies, but patches of sclerotium were frequently observed.

The climate of New Zealand is moist and genial, and very similar to that of the south-west of England. Twenty-two species of Mycetozoa were collected during my visit to Auckland and the region of the Hot Springs.

I will now describe the opportunities I had for collecting in the districts visited.

One day at Perth, West Australia, was occupied by a motor ride through King's Park, by the banks of the Swan River, and to the Zoological Gardens; here *Comatricha typhoides* was obtained.

In South Australia, two days were spent in the National Park, situated in the Mount Lofty Range twelve miles from Adelaide. Sixteen species of Mycetozoa were found here; as in the Handbook compiled for the use of the members of the British Association it is stated that only two species of Mycetozoa were recorded for South Australia, these gatherings were distinctly encouraging. *Physarum contextum* occurred on dead Eucalyptus leaves, and *Physarum vernum* on the shed bark of the Ribbony Gum (*E. viminalis*); *Arcyria insignis*, distinguished by its salmon-pink capillitium, was found on decaying wood. During a motor trip to the vineyards and distilleries of Angaston and Tanunda *Physarum citrinum* was obtained in the bright yellow plasmodium stage, and was tenderly nursed to maturity.

In Victoria the fern gullies in the beautiful Melbourne Botanical Gardens yielded *Trichia verrucosa* and *T. lateritia* in abundance, and a few sporangia of the rare *T. erecta*. In the grounds of Melbourne University *Craterium minutum* and *Arcyria incarnata* var. *fulgens* were obtained. On a week-end trip to Ballarat (1500 ft. alt.), *Physarum gyrosum* was gathered on dead leaves, and *Arcyria incarnata* var. *fulgens* on decayed wood; both were found in a pine plantation at the Creswick State Nursery.

In New South Wales, during a visit to Manley Beach, Sydney,

3 MAR. 1916

Arcyria ferruginea was found on a decaying log of She-oak (*Casuarina*), and at a garden-party at Government House, Rose Bay, *Stemonitis splendens* was obtained from a pine stump. At Katoomba, in the Blue Mountains, at an elevation of 3360 ft., amidst magnificent scenery, we gathered *Physarum flavicomum*, *P. viride*, and *Comatricha typhoides*. Katoomba is one of Sydney's favourite health resorts, near the famous Jenolan Caves; it is surrounded by well-wooded mountain ranges and moist flat-bottomed valleys, many square miles in extent, with deep precipitous sides clothed with rich wild vegetation. A day was pleasantly spent in the National Park of New South Wales; here *Hemitrichia Serpula* was found on the dead stump of a Grass Tree (*Xanthorrhœa* sp.), quite three feet from the ground, and *Diachæa leucopoda* and *Physarum viride* var. *incanum* on decaying twigs; but this place was not rich in Mycetozoa, probably owing to the gritty nature of the crumbling rocks causing rapid drainage and not favouring the accumulation of humus.

In Queensland we visited Nambour, in the Blackall Range, fifty miles from Brisbane, passing *en route* dense jungles of beautiful tropical vegetation, as well as sugar-cane and pineapple fields. A considerable extent of land was covered with Queensland's greatest pest, the *Opuntia*, or Prickly Pear. On its dead uprooted stems *Physarum nutans* var. *leucophœum* was found. A trolley ride through sugar-cane fields took us up the Nambour Gorge to the top of the Blackall Mountains. Here the trees were rich in epiphytic ferns and orchids. *Badhamia utricularis* was found amongst grass at the foot of a dead trunk covered with the leathery fungus *Schizophyllum commune*; in all probability the plasmodium had fed on the fungus before retiring to the grass to pass into its reproductive stage, but no trace of it was found on either the *Schizophyllum* or the bark. On this expedition I also collected *Dictydium cancellatum*, *Tubifera ferruginosa*, *Hemitrichia clavata*, and *Dianema corticatum*. Near Enoggara, a suburb of Brisbane, in tropical bush, were found *Stemonitis splendens*, *Arcyria incarnata*, and several species of *Trichia*.

The meeting of the British Association in Australia ended on September 4th, and the members will long remember the kind hospitality they enjoyed during their month's tour through the continent. After this somewhat strenuous period it was restful to spend a quiet fortnight with friends at Moruya, a little town on the southern coast of New South Wales, at the edge of a thousand square miles of primeval bush. This bush is composed of large trees, mainly Eucalyptus and Casuarina, growing some distance apart, with the ground between covered with bushes and creepers 3 to 10 ft. high. On the high open spaces "Burrawangs" (Cycads) occupied many acres in extent; in the deep gullies the vegetation was dense and interlaced, ferns and hepatics abounded in the moist places, and fallen trees crumbled to decay and were not consumed by termites, as they are on the high ground. Disregarding warnings about snakes, centipedes and scorpions, and braving the torments of mosquitoes, ticks, and sand-flies,

much collecting was done at leisure, and many species of Mycetozoa were gathered. *Colloderma oculatum* was found in a wet gully developing from inky-grey plasmodium which covered a fallen log of Iron-bark (*Eucalyptus sideroxylon*), and much of it was successfully brought to maturity indoors. A fine growth of the minute and inconspicuous species *Clastoderma Debaryanum* was also obtained here, and the rare *Physarum dictyospermum*; *Dictydiæthalium plumbeum* appeared in patches six to nine inches across covering dead leaves and twigs, and sending up clouds of ochraceous spore-dust when disturbed. *Leocarpus fragilis* was found to have travelled eighteen inches up the stem of the Cycad *Macrozamia spiralis* before forming sporangia. *Diderma radiatum* and *Comatricha irregularis* were also found, and abundance of *Trichia Botrytis* and *T. lateritia*. The welcome breakdown of a motor-car in the bush between Moruya and Nowra gave an opportunity for gathering in a new locality and recording half-a-dozen species. Altogether thirty-four species were found in this district.

The next collecting centre was in New Zealand, in the vicinity of Auckland; here *Trichia verrucosa*, *T. decipiens*, and *Hemitrichia Vesparium* were obtained. We then visited Rotorua, in the centre of the Hot Springs district, and within easy reach of the virgin bush. This consists of a dark, dense and almost impenetrable growth of vegetation, fringed on the outskirts with Dracænas and Tree-ferns; the ground and fallen trees are covered with filmy-ferns, mosses, and fungi. Collecting was difficult by reason of the entangling "supple-jacks" (*Rhipogonum scandens*, closely allied to *Smilax*) and "prickly lawyers" (*Rubus australis*), but we were free from the troublesome insects of the neighbouring continent. Among the twenty-two species of Mycetozoa obtained were *Cienkowskia reticulata*, *Physarum viride* var. *aurantium*, *Comatricha nigra* var. *alta*, and *Stemonitis splendens*; the last formed a huge patch on a log partly covered with silica deposit at the edge of Lake Rotorua, amidst the steam and sulphurous fumes from adjacent geysers.

I desire to express my thanks to Miss G. Lister for examining the gatherings, and for her notes on the species.

W. N. Cheesman.

II.

The following notes refer to the Mycetozoa collected by Mr. Cheesman, which he kindly submitted to me for examination. Over one hundred and fifty specimens were obtained; although no new species occurs amongst them, the collection is of much value in extending the known range of many species, some of which have hitherto been considered rare.

My information as to previous records of Australian Mycetozoa is based chiefly on the collections in the herbaria of Kew and the British Museum; these have not been enriched by many gatherings from the Antipodes of late years, but it is probable that a number of further records have been obtained there. Our knowledge of

New Zealand Mycetozoa was much extended by Miss Hibbert Ware's researches in the North and South Islands and in Stewart Island in 1904.*

I have drawn up the following table (see pp. 5–6) showing the species occurring in Australia, Tasmania, and New Zealand, and mark with a cross (×) records made before Mr. Cheesman's visit, and with C the localities where, as far as I am aware, his record is the first. It will be seen at a glance how much our knowledge of the distribution of Mycetozoa has been increased as the result of his enthusiastic labours, and it is to be hoped that his success may induce some of those residing in the great continent, of which we have still so much to learn, to follow his example along similar lines of research.

Ceratiomyxa fruticulosa (Muell.) Macbr. Moruya, N. S. W. This species is very abundant in New Zealand, and probably is so also in many parts of Australia in favourable seasons.

Badhamia utricularis (Bull.) Berk. Blackall Mts., Q., on grass at the base of a dead tree covered with *Schizophyllum commune*; typical.

Physarum melleum (Berk. & Br.) Massee. Near Adelaide, S. A., on leaves. The specimen is immature, but the tawny-yellow sporangia on nearly white stalks are typical.

P. citrinum Schum. Near Tanunda, Adelaide, S. A. Obtained in the plasmodium stage and matured indoors; the nearly white stalks at first suggested *P. sulphureum* Alb. & Schw.; the rigid densely branching capillitium and yellow lime-knots are, however, characteristic of *P. citrinum*.

P. dictyospermum Lister. Moruya, N. S. W., on twigs and bark. This is similar to the type gathered in Stewart Island, N. Z., by Miss Hibbert Ware, except that the black stalks are more uniformly slender. The only other known gathering of this inconspicuous species was obtained in the Jura Mountains, Switzerland, in November, 1912, by M. Ch. Meylan; in this the spores, instead of being closely and regularly reticulated as in the type, are marked with an irregular broken reticulation of short thickened ridges and warts.

P. viride (Bull.) Pers. Adelaide, S. A.; Katoomba and Nowra, N. S. W.; and near Brisbane, Q.—Var. *aurantium* Lister. Rotorua, N. Z.—Var. *incanum* Lister. National Park, Sydney. The sporangia in this specimen are pale yellow on one side and nearly white on the other, as if they had been bleached by exposure to strong light.

P. flavicomum Berk. Sydney, Katoomba, and Moruya, N. S. W.; and Nambour, Blackall Mts., Q. The gatherings from Moruya and Nambour are typical, with slender orange-brown stalks, iridescent sporangia 0·35 mm. diam., slender, widely-branching capillitium and purplish nearly smooth spores, 9 μ diam. The specimens from Katoomba and National Park, Sydney, are un-

* See "Mycetozoa of New Zealand," by A. and G. Lister, Journ. Bot. xliii. pp. 111–114 (1905).

TABLE OF MYCETOZOA RECORDED FROM AUSTRALIA, TASMANIA, AND NEW ZEALAND.	W. Australia	S. Australia	Victoria	New South Wales	Queensland	Tasmania	New Zealand
Ceratiomyxa fruticulosa (Muell.) Macbr.	—	—	—	C	—	—	×
,, ,, var. *flexuosa*	—	—	—	—	×	—	—
Badhamia utricularis (Bull.) Berk.	—	—	—	×	C	—	—
Physarum melleum (Berk. & Br.) Mass.	—	C	—	—	—	—	—
,, *globuliferum* (Bull.) Pers.	—	—	—	—	—	—	×
,, *citrinum* Schum.	—	C	—	—	—	—	×
,, *dictyospermum* Lister	—	—	—	C	—	—	×
,, *viride* (Bull.) Pers.	—	C	—	C	—	×	×
,, ,, var. *aurantium*	—	—	—	—	—	—	×
,, ,, var. *incanum*	—	—	—	C	—	—	C
,, *flavicomum* Berk.	×	—	—	×	C	—	—
,, *nutans* Pers.	×	—	—	—	—	×	×
,, ,, subsp. *leucophæum*	—	—	×	C	C	—	×
,, *pusillum* (Berk. & Curt.) Lister	—	—	×	—	—	—	×
,, *compressum* Alb. & Schw.	—	C	×	—	—	—	×
,, *cinereum* Pers.	×	—	—	×	—	—	×
,, *vernum* Somm.	—	C	—	—	—	—	—
,, *gyrosum* Rost.	—	—	C	—	—	—	—
,, *sinuosum* (Bull.) Weinm.	—	—	—	×	—	—	—
,, *bogoriense* Racib.	—	—	—	—	×	—	—
,, *bitectum* Lister	—	—	—	C	—	—	—
,, *contextum* Pers.	—	C	—	—	—	×	—
,, *lateritium* (Berk. & Rav.) Morg.	—	—	—	—	—	—	C
Fuligo septica Gmel.	—	×	×	×	×	×	×
Cienkowskia reticulata (Alb. & Schw.) Rost.	—	—	—	—	—	—	C
Craterium minutum (Leers) Fries	×	C	C	—	C	×	×
,, *leucocephalum* Ditmar	—	—	—	—	—	—	×
Leocarpus fragilis (Dicks.) Rost.	—	—	—	C	—	×	—
Diderma effusum (Schw.) Morg.	—	—	—	C	—	—	—
,, *radiatum* (L.) Lister	—	—	—	C	—	—	—
Diachæa leucopoda (Bull.) Rost.	—	—	×	C	—	—	×
Didymium difforme (Pers.) Duby	—	×	—	C	—	—	×
,, *melanospermum* (Pers.) Macbr.	—	—	—	—	—	—	×
,, *nigripes* Fries var. *xanthopus*	—	C	C	C	×	—	C
,, *squamulosum* (Alb. & Schw.) Fr.	—	C	C	C	—	—	×
Colloderma oculatum (Lippert) G. Lister	—	—	—	C	—	—	—
Stemonitis fusca Roth	—	×	—	—	×	—	×
,, *splendens* Rost.	—	×	×	C	×	—	×
,, ,, var. *Webberi*	—	—	—	C	—	—	—
,, ,, var. *flaccida*	—	—	—	—	—	—	×
,, *herbatica* Peck	×	—	—	×	—	—	×
,, *ferruginea* Ehrenb.	—	—	—	×	—	—	×
Comatricha nigra (Pers.) Schroet.	—	C	—	C	—	—	×
,, ,, var. *alta*	—	—	—	—	—	—	C
,, *typhoides* (Bull.) Rost.	C	—	C	C	C	—	×
,, *irregularis* Rex	—	—	—	C	—	—	—
Lamproderma echinulatum Rost.	—	—	—	—	—	×	×
,, *violaceum* (Fries) Rost.	—	—	—	—	—	×	—
Clastoderma Debaryanum Blytt	—	—	—	C	—	—	C
Cribraria argillacea Pers.	—	—	—	C	—	—	—
,, *aurantiaca* Schrad.	—	—	—	—	—	—	×
,, *intricata* Schrad.	—	—	—	—	—	—	×
Dictydium cancellatum (Batsch) Macbr.	—	—	—	C	C	—	×
Tubifera ferruginosa Gmelin	—	—	×	C	×	—	×
Dictydiæthalium plumbeum (Schum.) Rost.	×	—	C	C	C	—	C

TABLE OF MYCETOZOA RECORDED FROM AUSTRALIA, TASMANIA, AND NEW ZEALAND.	W. Australia	S. Australia	Victoria	New South Wales	Queensland	Tasmania	New Zealand
Reticularia Lycoperdon Bull.	—	C	—	—	—	—	×
Lycogala epidendrum (L.) Fries	—	—	—	C	—	—	×
,, ,, var. *tessellatum*	—	—	—	—	—	—	×
Trichia verrucosa Berk.	—	—	C	×	—	×	×
,, *affinis* De Bary	—	—	C	C	—	—	×
,, *persimilis* Karsten	—	—	×	C	C	—	×
,, *varia* Pers.	—	C	—	C	—	—	C
,, *decipiens* (Pers.) Macbr.	—	C	C	C	—	—	×
,, *erecta* Rex	—	—	C	C	—	—	C
,, *Botrytis* Pers.	—	C	—	C	C	×	×
,, ,, var. *cerifera*	—	—	—	C	—	—	C
,, *lateritia* Lév.	—	—	C	×	C	×	×
Hemitrichia Vesparium (Batsch) Macbr.	—	C	—	C	—	—	C
,, *clavata* (Pers.) Rost.	—	—	—	—	C	—	C
,, *Serpula* (Scop.) Rost.	—	—	—	C	—	—	×
Arcyria ferruginea Sauter	—	—	—	×	—	—	×
,, *cinerea* (Bull.) Pers.	—	—	—	C	×	—	×
,, *denudata* (L.) Sheldon	—	—	—	—	—	—	×
,, *insignis* Kalchbr. & Cooke	—	C	—	—	—	—	—
,, *incarnata* Pers.	×	—	—	—	C	—	×
,, ,, var. *fulgens*	—	—	C	C	—	—	C
,, *nutans* (Bull.) Grev.	—	C	C	—	—	—	×
,, *Œrstedtii* Rost.	—	—	—	×	—	—	—
Perchæna depressa Libert	—	—	C	—	×	—	—
,, *corticalis* (Batsch) Fries	—	C	—	C	—	×	—
Dianema corticatum Lister	—	—	—	—	C	—	—
Prototrichia metallica (Berk.) Mass.	—	—	—	—	—	×	—

usual in several respects. The sporangia are depressed, 0·7 to 1 mm. diam. on long twisted stalks, grey-brown below, yellowish above; the capillitium is almost *Badhamia*-like, and consists of a dense network of flattened threads and tubes broadly expanded at the angles, enclosing scanty deposits of yellow lime-granules; the spores are rich brown, spinulose, 10–11 μ diam. The dark spores recall those of the nearly allied *P. viride* Pers. var. *rigidum*, but the dense network of the capillitium is characteristic of *P. flavicomum*. A nearly similar form, obtained over forty years ago from Mossmans Bay, Sydney, by Whitelegge, is in the Kew Herbarium (K. 346).

P. nutans Pers. Moruya, N. S. W.—Subsp. *leucophæum*. Moruya and Blackall Mts., Q.

P. compressum Alb. & Schw. Adelaide, S. A. Sporangia clustered on dead bark.

P. vernum Somm. Adelaide. Two gatherings, one with robust sporangia on shed bark of Eucalyptus; the other, a small form on grass, closely resembling *P. cinereum* Pers., but with dark spores, 12 μ diam.

P. gyrosum Rost. Creswick, near Ballarat. A beautiful development on dead leaves.

P. bitectum Lister. Moruya, N. S. W., on dead leaves.

P. contextum Pers. Near Adelaide, S. A., on dead leaves. The orange sporangia are both clustered and free.

P. lateritium (Berk. & Rav.) Morg. Auckland, N. Z., on dead wood. The sporangia are scattered, brick-red and either smooth or scaly; the capillitium knots are yellowish with red centres.

Cienkowskia reticulata (Alb. & Schw.) Rost. Rotorua, N. Z., on dead wood. The red net-like plasmodiocarps are small but typical.

Craterium minutum (Leers.) Fries. Adelaide, S. A., and Melbourne, V.

Leocarpus fragilis (Dicks.) Rost. Sydney and Moruya, N. S. W. This species is rare in the tropics, and abundant in the Northern Hemisphere. This is the second record that I know of from the Southern Hemisphere.

Diderma effusum (Schwein.) Morg. Moruya, N. S. W., on bark. An extensive but mouldy development of net-like plasmodiocarps.

D. radiatum (L.) Lister. Moruya, N. S. W., on bark and lichen. The pale drab sporangia grouped in clusters of three to six are of the f. *umbilicatum* (Fries), with irregular dehiscence; the short stalks are nearly white, but the hypothallus is orange-red. Possibly this may have developed from red plasmodium like Dr. Rönn's specimen from Kiel, referred to in *Mycetozoa*, p. 113.

Diachæa leucopoda (Bull.) Rost. National Park, Sydney, on dead leaves.

Didymium difforme (Pers.) Duby. Moruya, N. S. W., on dead leaves.

D. squamulosum (Alb. & Schwein.) Fries. Adelaide, S. A.; Melbourne, V.; Sydney, N. S. W.; Brisbane, Q., on dead leaves.

Colloderma oculatum (Lippert) G. Lister. Moruya, N. S. W., on the bark of dead Iron-wood (*Eucalyptus sideroxylon*). A fine development of glossy brown plasmodiocarps, some of which were matured indoors from inky-grey plasmodium; the outer sporangium-wall swells up when moist to form a thick gelatinous coat; the capillitium is unusually slender and sparingly branched; the spores measure 15 μ, and are larger, rougher and darker than those of any other gathering that I have seen. It is curious that this species, first described by Lippert in 1894 from specimens developed on a culture indoors in Austria—then almost forgotten until it was found in Scotland in 1910—should now have been obtained from England, Switzerland, Portugal, Australia, Japan, and New England.

Stemonitis fusca Roth. Mamaku, N. Z.

S. splendens Rost. Enoggara, Q.; Rotorua, N. Z. The New Zealand gathering is a grand development, the closely ranked sporangia covering an area of several square inches. — Var. *Webberi* Rex. National Park for N. S. W., Sydney, on a pine stump. This specimen has such lax capillitium that it approaches var. *flaccida* Lister.

Comatricha nigra (Pers.) Schroet. Adelaide, S. A.; Moruya, N. S. W. Scanty specimens, with globose sporangia.—Var. *alta* Lister. Rotorua, N. Z.

C. typhoides (Bull.) Rost. Perth, W. A.; Ballarat, V.; Katoomba and Moruya, N. S. W.; Brisbane, Q.; very abundant.

C. irregularis Rex. Moruya, N. S. W., on dead wood. This seems to be the first record of the species outside North America.

Clastoderma Debaryanum Blytt. Moruya, N. S. W.; Rotorua, N. Z., on dead wood. The stalk in this species has an unusual structure; the upper part is slender, translucent, brown and solid; the lower part is much stouter, opaque, rugose and blackish, and encloses refuse matter; about the middle of the stalk there is usually a bright brown swollen portion, shining and rather sticky on the outside and with refuse matter inside. *Echinostelium* resembles *Clastoderma* in having a more or less tubular stalk enclosing refuse matter. In all other genera of the *Stemonitaceæ* the stalk is either solid throughout, or the lower part consists within of a close network of interlacing strands entirely free from refuse matter.

Cribraria argillacea Pers. Moruya, N. S. W.

Dictydium cancellatum (Batsch) Macbr. Moruya, N. S. W.; Blackall Mts., Q. The sporangia are both large and small, and are of the typical form.

Tubifera ferruginosa Gmel. National Park, Sydney, and Moruya, N. S. W.; Enoggara, Q.

Reticularia Lycoperdon Bull. Adelaide, S. A. A single æthalium about an inch in diameter.

Dictydiathalium plumbeum (Schum.) Rost. Ballarat, V.; Moruya, N. S. W.; Brisbane, Q.; Rotorua, N. Z. In the Australian gatherings the threads of the pseudo-capillitium are typically slender, and measure from 3 to 5 μ diam.; in the New Zealand gathering they are 6 to 7 μ thick. The spores are clay-coloured in all Mr. Cheesman's specimens.

Lycogala epidendrum (L.) Fries. Moruya, N. S. W.

Trichia affinis De Bary. Melbourne, V.; Sydney and Moruya, N. S. W.; Blackall Mts., Q.; Rotorua, N. Z.

T. persimilis Karsten. Melbourne, V.; Moruya, N. S. W.; Blackall Mts., Q.; Auckland and Rotorua, N. Z.

T. verrucosa Berk. Botanic Gardens, Melbourne, V.; Moruya, N. S. W.; Auckland, N. Z.

T. varia Pers. Adelaide, S. A.; Moruya, N. S. W.; Mamaku, N. Z.

T. erecta Rex. Melbourne, V.; Moruya, N. S. W.; Rotorua and Mamaku, N. Z. It is interesting that this species, apparently rare in most places, should be represented so abundantly in Mr. Cheesman's gatherings. The sporangia vary in colour from dark purple veined above with orange to reddish brown veined with a paler shade; the spores and elaters in all specimens are rich orange-yellow.

T. decipiens (Pers.) Macbr. Adelaide, S. A.; Ballarat, V.; Moruya, N. S. W.; Auckland and Mamaku, N. Z.

T. Botrytis Pers. Adelaide, S. A.; Moruya, N. S. W.; Enoggara, Q. Besides the typical form Mr. Cheesman has obtained two gatherings (from Moruya, N. S. W., and Mamaku,

N. Z.) of a curious variety, having the walls of the sporangium and stalk studded with deposits of a sulphur yellow waxy or resinous substance; these deposits vary in size from small scattered granules to large discoid patches, and are either embedded in blister-like pouches of the wall, or lie freely on the surface; in extreme cases they give a yellow colour to almost the whole of the stalk and sporangium-wall; they stain deep red with tincture of alkannin. I have known this variety for many years; it has been found in various parts of England, in Scotland, and in Wales. As it seems a well-marked and constant form I propose to call it var. *cerifera*. The only other species of the Mycetozoa in which wax is known to occur is *Diachæa cerifera* G. Lister; here it either forms a collar round the base of the sporangium, or is enclosed within the walls of the stalk.

T. lateritia Léveillé. Melbourne and Ballarat, V.; Sydney and Moruya, N. S. W.; Enoggara, Q.; Auckland, N. Z. In 'Mycetozoa' this is placed as a variety of *T. Botrytis*, which it closely resembles, and to which it is undoubtedly nearly allied. It differs, however, essentially in the structure of the stalk. In all forms of *T. Botrytis* the walls of the stalk are somewhat granular, and enclose a network of rugged, branching tubules containing refuse matter; the stalk is therefore more or less opaque when mounted in glycerine. In *T. lateritia* the stalk is translucent in glycerine, and consists of a closely folded bright red-brown membrane enclosing a few inconspicuous narrow strands and slender threads; sometimes a little refuse matter is enclosed at the base, and exceptionally small masses of spore-like cells occur within the folds of the stalk. We infer, therefore, that in the developing sporangium of *T. lateritia* the plasmodium ejects its refuse matter before the stalks are formed, and in *T. Botrytis* refuse matter is retained in the stalk, and is only excluded from the spore-plasm when the wall bounding the spore-cavity is laid down. Apart from the stalk characters, *T. lateritia* may be distinguished from *T. Botrytis* by the elaters being redder and having more shortly tapering ends, and by the warm orange colour of the spores; the sporangia vary in colour from red to purple-black; they are never yellowish olive in colour. The type of *T. lateritia* from Chili has been preserved; it has dull brick-red sporangia, as the name implies; the stalks are long, red and slender, and show the characteristic structure well. Possibly Fries had this abundant and widely distributed species in mind when describing *T. pyriformis* Hoffm. in *Systema Mycologicum*, iii. p. 184, but Hoffman's original description and figure (Veg. Crypt. ii. 1, t. 1, fig. 1) unquestionably refer to *Hemitrichia Vesparium*.

Hemitrichia Vesparium (Batsch) Macbr. Adelaide, S. A.; Moruya, N. S. W.; Mamaku, N. Z., typical.

H. clavata (Pers.) Rost. Blackall Mts., Q.; Mamaku, N. Z., typical.

H. Serpula (Scop.) Rost. National Park, Sydney and Moruya, N. S. W. In both these gatherings the outer walls of the

plasmodiocarps are unusually stout and dark red-brown; the capillitium and spores are orange-scarlet and very showy.

Arcyria incarnata Pers. Enoggara, Q.; Auckland, N. Z.—Var. *fulgens* Lister. Melbourne and Ballarat, V.; Moruya, N. S. W.; Rotorua, N. Z. This variety is more robust than the type, the capillitium and spores are bright crimson and the walls of the sporangial cup are firmer.

A. insignis Kalchbr. & Cooke. Adelaide, S. A. A beautiful specimen, consisting of several small clusters of pale salmon-coloured sporangia.

A. cinerea (Bull.) Pers. Moruya, N. S. W. Scattered cylindrical sporangia, weathered to a brown colour.

A. ferruginea Saut. Sydney, N. S. W.; Rotorua, N. Z.

A. nutans (Bull.) Grev. Adelaide, S. A.; Melbourne, V.; Rotorua, N. Z.; typical but rather weathered specimens.

Perichæna corticalis (Batsch.) Fries. Adelaide, S. A.; Moruya, N. S. W. The capillitium in both specimens is slender and scantily developed.

P. depressa Libert. Melbourne, V. The sporangia are much flattened; in many the dark brown outer wall has fallen away above like a lid, leaving the shining membrane enclosing the yellow spores intact. The capillitium is abundant and stouter than in British specimens, the threads being 3–4 μ diam.; they are regularly notched with shallow constrictions.

Dianema corticatum Lister. Blackall Mts., Q. A group of glossy lilac-brown plasmodiocarps on dead wood. The capillitium is fairly abundant, and shows in some parts traces of spiral thickening. This species is widely distributed in Britain; in Europe it has been obtained from Norway, Sweden, Switzerland, and Austria. It has also been found near Quebec by Mr. J. W. Eastham.

G. Lister.

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